<u>In the Claims:</u>

Please amend the claims as follows:

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1. (Original) A method of physically spatially switching a small particle to a selected one of plural alternative destination locations the method comprising:

suspending the particle in fluid flowing in a microfluidic channel from (i) an upstream location through (ii) a junction branching to (iii) each of plural branch channels leading to alternative downstream destination locations; and

manipulating the particle under force of radiation as it moves in the microfluidic channel so as to move into a selected branch channel leading to a selected one of the plural alternative downstream destination locations.

2. (Original) The small particle switching method according to claim 1

wherein the manipulating is with a single radiation beam, the particle suspended within the flowing fluid passing straight through the junction into a path leading to a first downstream destination location in absence of the radiation beam but deflecting under radiation force in presence of the radiation beam into an alternative, second, downstream destination location.

3. (Original) The small particle switching method according to claim 2

wherein the manipulating is with a selected one of two radiation beams impinging on the junction from different directions, the particle suspended within the flowing fluid deflecting under radiation force of one radiation beam into a first path leading to a first downstream destination location while deflecting under radiation force of the other, different direction, radiation beam into a second path leading to a second downstream destination location.

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4. (Original) The small particle switching method according to claim 1

wherein the manipulating is with a laser beam.

5. (Original) The small particle switching method according to claim 4

wherein the manipulating is with a Vertical Cavity Surface Emitting (VCSEL) laser beam.

6. (Currently Amended) The small particle ~~manipulating~~ **<u>switching</u>** method according to claim ~~6~~ <u>4</u>

wherein the manipulating is with a Vertical Cavity Surface Emitting (VCSEL) laser beam having Laguerre-Gaussian spatial energy distribution.

7. (Currently Amended) A switching mechanism for a small particle comprising:

a substrate in which is present at least one microfluidic channel proceeds from (i) an upstream location through (ii) at least one junction branching to (iii) each of plural downstream locations, the substrate being radiation transparent at the at least one junction;

A7

flow means **that** induces in the microfluidic channel a flow of fluid bearing the small particle; and

a module operable to produce at least one radiation beam **which** is selectively enabled to pass through the radiation-transparent junction region of the substrate and into the microfluidic channel so as to there selectively produce a radiation force on the small particle as it flows by sufficient so as to move the particle into a selected one of the plural downstream locations.

8. (Original) The switching mechanism according to claim 7

wherein the substrate has plural levels differing in distance of separation from a major surface of the substrate, the at least one microfluidic channel branching at the at least one junction between at least (i) one, first, path continuing on the same level and (ii) another, alternative second, path continuing on a different level; and

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wherein one only radiation beam selectively acts on the small particle at the junction so as to (i) produce when ON a radiation force on the small particle at the junction that will cause the small particle to flow into the alternative second path, but which (ii) will when OFF permit the small particle to continue flowing upon the same level and into the first path.

9. (Original) The switching mechanism according to claim 7

wherein a selected one of two separately-directed radiation beams acts on the small particle at the junction so as to produce a directional radiation force on the small particle which force causes this small particle to flow into the selected one of the plural downstream locations.

10. (Original) The switching mechanism according to claim 7

wherein different microfluidic channels proceed through the at least one junction so as to collectively branch to each of m different downstream locations; wherein the small particle appearing at the junction in flow from any of the n different microfluidic channels is acted upon by the radiation beam so as to flow into a selected one of the m different downstream locations.

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11. (Original) The switching mechanism according to claim 10

wherein two opposed radiation beams selectively pass through the radiation-transparent junction region of the substrate and into the microfluidic channel so as to there selectively produce a radiation force on the small particle as it flows by sufficient so as to move the particle into a selected one of the m different downstream locations.

12. (Currently Amended) A switch for controllably spatially moving and switching a small particle arising from a particle source into a selected one of a plurality of particle sinks, the switch comprising:

a radiation-transparent microfluidic device defining a branched microfluidic channel, in which channel fluid containing a small particle can flow, proceeds from (i) particle source to (ii) a junction where the channel then branches into (iii) a plurality of paths respectively leading to the plurality of particle sinks;

flow means **to** induce a flow of fluid, suitable to contain the small particle, in the microfluidic channel from the particle source through the junction to all the plurality of particle sinks; and

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a module to produce at least one radiation beam **which** is selectively enabled to pass through the radiation-transparent microfluidic device and into the junction so as to there produce a radiation force on a small particle as it passes through the junction within the flow of fluid, therein by this selectively enabled and produced radiation force selectively directing the small particle that is within the fluid flow into a selected one of the plurality of paths, and to a selected one of the plurality of particle sinks;

wherein the small particle is physically transported in the microfluidic channel from the particle source to that particular particle sink where it ultimately goes by action of the flow of fluid within the microfluidic channel; and

wherein the small particle is physically switched to a selected one of the plurality of microfluidic channel paths, and to a selected one of the plurality of particle sinks, by action of radiation force from the radiation beam.

13. (Original) The small particle switch according to claim 12

wherein the branched microfluidic channel of the radiation-transparent microfluidic device is bifurcated at the junction into two paths respectively leading to two particle sinks;

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wherein the flow means is inducing the flow of fluid suitable to contain the small particle from the particle source through the junction to both particle sinks; and

wherein at least one radiation beam is selectively enabled to produce a radiation force on a small particle as it passes through the junction within the flow of fluid so as to selectively direct the small particle into a selected one of the two paths, and to a selected one of the two particle sinks.

14. (Original) The small particle switch according to claim 12

wherein two radiation beams are selectively enabled to produce a radiation force on a small particle as it passes through the junction within the flow of fluid so as to selectively direct the small particle into a selected one of the two paths, and to a selected one of the two particle sinks, one of the two radiation beams being enabled to push the particle into one of the two paths and the other of the two radiation beams being enabled to push the particle into the other one of the two paths.

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15. (Original) The small particle switch according to claim 12

wherein the branched microfluidic channel of the radiation-transparent microfluidic device is bifurcated at the junction into two paths one of which paths proceeds straight ahead and another of which paths veers away, the two paths respectively leading to two particle sinks;

wherein one radiation beam is selectively enabled to produce a radiation force on a small particle as it passes through the junction within the flow of fluid so as to push when enabled the small particle into the path that veers away, and so as to permit when not enabled that the particle will proceed in the path straight ahead.

16. (Original) The small particle switch according to claim 12

wherein the bifurcated microfluidic channel of the radiation-transparent microfluidic device defines a geometric plane; and

wherein the one radiation beam is substantially in the geometric plane at the junction.

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Claims 17-31 are cancelled.

32. (Original) A microfluidic device for sorting a small particle within, and moving with, fluid flowing within microfluidic channels within the device, the microfluidic device comprising:

a housing defining one or more microfluidic channels, in which channels fluid containing at least one small particle can flow, at least one microfluidic channel having at least one junction, said junction being a place where a small particle that is within a fluid flow proceeding from (i) a location within a microfluidic channel upstream of the junction, through (ii)the junction to (iii) a one of at least two different, alternative, microfluidic channels downstream of the junction,

may be induced to enter into a selected one of the two downstream channels;

flow means for inducing an upstream-to-downstream flow of fluid containing the at least one small particle in the microfluidic channels of the housing and through the junction; and

optical means for selectively producing photonic forces on the at least one small particle as it flows through the junction so as to controllably direct this at least one small particle that is within the fluid flow into a selected one of at the least two downstream microfluidic channels;

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wherein the at least one small particle is transported from upstream to downstream in microfluidic channels by the flow of fluid within these channels; and

wherein the at least one small particle is sorted to a selected downstream microfluidic channel under photonic force of the optical means.

33. (Original) The small particle microfluidic sorting device according to claim 32

wherein the junction is in the topological shape of an inverted "Y" or, topologically equivalently, a "T", where a stem of the "Y", or of the "T", is the upstream microfluidic channel,

and where two legs of the "Y", or, topologically equivalently, two segments of the crossbar of the "T" , are two downstream microfluidic channels.

34. (Original) The small particle microfluidic sorting device according to claim 32

wherein the junction is in the shape of an "X", where two legs of the "X" are upstream microfluidic channels, and where a remaining two legs of the "X" are two downstream microfluidic channels.

35. (Original) The small particle microfluidic sorting device according to claim 32

wherein the optical means produces photonic pressure force that pushes the at least one small particle in a selected direction.

36. (Original) The small particle microfluidic sorting device according to claim 32

wherein the optical means produces a radiation beam that enters the junction from a direction substantially orthogonal to the microfluidic flow paths at the junction.

37. (Original) The small particle microfluidic sorting device according to claim 32 wherein the optical means comprises:

a laser.

38. (Original) The small particle microfluidic sorting device according to claim 37 wherein the laser comprises:

a Vertical Cavity Surface Emitting Laser (VCSEL).

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39. (Original) The small particle microfluidic sorting device according to claim 38

wherein the VCSEL produces a radiation beam that enters the junction from a direction substantially orthogonal to the microfluidic flow paths at the junction.

40. (Original) The small particle microfluidic sorting device according to claim 38

wherein the VCSEL produces a radiation beam that enters the junction from a direction substantially in a plane established by the microfluidic flow paths at the junction.

41. (Original) The small particle microfluidic sorting device according to claim 32

wherein the housing defines a plurality of microfluidic channels each with at least one junction;

and wherein the optical means comprises:

an array of laser light sources operable in parallel to each selectively illuminate an associated junction so as to selectively cause at the same time various small particles that are moving through various of the junctions to controllably enter into a selected one of at least two microfluidic channels downstream of each junction.

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42. (Original) The small particle microfluidic sorting device according to claim 41 wherein the array of laser light sources comprises:

an array of Vertical Cavity Surface Emitting Lasers (VCSELs).

Please add the following new claims:

43. (New) A method of sorting particles in a branched microfluidic channel comprising the steps of:

providing a device having a branched microfluidic channel, the branched microfluidic channel including a junction where a

single microfluidic channel branches into a plurality of branch channels;

flowing fluid through the branched microfluidic channel, the fluid containing a plurality of particles; and

irradiating a portion of the single microfluidic channel with a radiation beam, the radiation beam selectively directing the plurality of particles into the plurality of branch channels, wherein the radiation beam does not fully trap the plurality of particles.

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44. (New) The method of claim 43, further comprising the step of collecting the particles in at least one of the branch channels.

45. (New) The method of claim 43, wherein two of the plurality of branch channels are respectively located in two different planes.

46. (New) The method of claim 43, wherein the particles are cells.

47. (New) A method of sorting particles in a three-dimensional microfiuidic device comprising the steps of:

providing a device having a first microfluidic channel and a second microfluidic channel, the first and second microfluidic channels oriented in an overlapping manner to form a junction at an intersection of the first and second microfiuidic channels;

flowing fluid through the first and second microfluidic channels, the first microfluidic channel including a plurality of particles within the fluid; and

irradiating the junction with a radiation beam so as to transfer at least a portion of the particles from the first microfiuidic channel to the second microfluidic channel.

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48. (New) The method of claim 47, wherein the particles are cells.

49. (New) A microfluidic sorting device for sorting particles comprising:

a substrate having a main microfluidic channel that branches into a plurality of microfluidic branch channels, the plurality of branch channels connecting to the main microfluidic channel at a junction;

flow means for inducing fluid flow in the main microfluidic channel and plurality of branch channels, the fluid flow in the main microfluidic channel containing the particles; and

a radiation source to produce at least one radiation beam directed at a portion of the main microfuidic channel, the radiation beam selectively directing the particles into the plurality of microfluidic branch channels, wherein the radiation beam does not fully trap the plurality of particles.

50. (New) The microfluidic sorting device of claim 49, wherein the particles are cells.

51. (New) The microfluidic sorting device of claim 49, wherein the radiation source includes a laser and the radiation beam is a laser beam.

52. (New) A device, comprising:

an input fluid channel to carry an input fluid flow having particles therein;

at least two output fluid channels coupled to the input fluid channel to form a junction to receive portions of the input fluid flow to produce two output fluid flows, respectively; and

a module to produce an optical beam that illuminates a part of the fluid flow in the input fluid channel to optically push a

particle from the particles in the input fluid flow into either one of the two output fluid flows in response to a control.

53. (New) The device as in claim 52, further comprising a flow inducer to cause a fluid to flow from the input fluid channel to the two output fluid channels.

54. (New) The device as in claim 52, wherein the optical beam is to optically exert a force on the particle without fully trapping the particle.

A7 cont.

55. (New) The device as in claim 52, wherein the input fluid channel is in a first plane and one of the two output fluid channels is in a second, different plane.

56. (New) The device as in claim 52, wherein the module is configured to produce the optical beam in a first direction which optically pushes the particle into one of the two output channels, and wherein the module is further configured to produce a second optical beam in a second direction to optically push the particle into the other output fluid channel.